भारतीय मानक
Indian Standard

IS 17632 : 2022

[*Superseding* IS 3763 : 1982, IS 4103 : 1977, IS 6185 : 1971 *and* IS 6632 : 1988]

सामान्य कार्यों के लिए कुर्सियां और स्टूल — विशिष्टि

General Purpose Chairs and Stools — Specification

ICS 97.140

© BIS 2022

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

March 2022 **Price Group 10**

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Furniture Sectional Committee had been approved by the Civil Engineering Division Council.

The Indian Standard on different type of general purpose chair and stool were published/revised as IS 4103 : 1977 'Specification for metal nesting chair (*first revision*)', IS 3763 : 1983 'Specification for metal folding chairs (*first revision*)', IS 6185 : 1971 'Specification and safety requirements for high chairs', and IS 6632 : 1988 'Specification for wooden folding chairs (*first revision*)'. In view in the diversification in the use of different materials and finishing system in the furniture industry, this Indian standard has been brought out and supersedes IS 4103 : 1977, IS 3763 : 1983, IS 6185 : 1971 and IS 6632 : 1988. In this version, the requirements related to the performance and safety in the term of strength, stability and durability for general purpose chair and stool have been specified. It also applies to ready-to-assemble units; in that case the requirements of this standard shall apply to the assembled units.

This standard does not apply to test for reclining or tilting chairs. It also does not apply to settees and other multiple seating, nor to rocking chairs. The tests are designed to be applied to an article of furniture that is fully assembled and ready for use. The Standard does not include tests for work chairs with swivel and chair base having castors or studs covered under IS 17631 : 2021 Work chairs — Specification. For the purpose of this standard, pouffes are considered as stools.

Assessment of ageing and degradation is not included. The tests are not intended to assess the durability of stuffing materials, upholstery fabrics or foam cushions.

Forces and dimensions in the tests are applicable to chairs and stools intended for adult persons. The tests consist of applications to various parts of the item, of loads or forces simulating normal functional use, as well as misuse that might reasonably be expected to occur. Tests carried out according to this standard are intended to demonstrate the ability of the item to give satisfactory service in its intended environment. Such tests do not ensure that structural failure will not eventually occur as a result of habitual misuse or after an excessively long period of service, or more than occasional use by persons weighing more than 110 kg. The tests are designed to evaluate properties without regard to materials, design/construction or manufacturing processes.

The figures given in this standard are typical and the test procedures shall be followed.

In the formulation of this standard, considerable assistance has been derived from the following:

ISO 7173 : 1989 'Furniture — Chairs and stools — Determination of strength and durability;

ISO 7174-1 : 1988 'Furniture — Chairs — Determination of stability'.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960. 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GENERAL PURPOSE CHAIRS AND STOOLS — SPECIFICATION

1 SCOPE

This standard covers the requirements for general purpose chairs and stools. This standard applies to completely manufactured/fabricated general purpose chairs and stools. It also applies to ready-to-assemble units; in that case the requirements of this standard shall apply to the assembled units.

2 REFERENCES

The following Indian standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in below:

IS No.	*Title*
3663 : 2018	Dimensions of tables and chairs for office purposes (*third revision*)
3400 (Part 2) : 2014/ ISO 48 : 2010	Methods of test for vulcanized rubber: Part 2 Rubber, vulcanized orthermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD) (*fourth revision*)
16774 : 2018	Flexible cellular polymeric materials — Determination of hardness (Indentation Technique)
17637 : 2021	Performance requirements of surface finishes for furniture applications

3 TERMINOLOGY

For the purposes of this part of standard, the following definitions shall apply.

3.1 Durability Tests — Tests simulating the repeated movement of components occurring during long-term use and assessing the strength of the furniture under such conditions.

3.2 Stability Tests — Tests for the ability to withstand load in all normal use conditions without the product toppling or creating unsafe use case like injury to user or inability to perform task the product is meant for.

3.3 Strength Tests — Tests for the capacity of the product to withstand force or pressure as per usage conditions considering the extreme use conditions for a limited frequency of use.

3.3.1 *Static Tests* — Tests consisting of heavy loads being applied statically one or more times to ensure that the furniture has sufficient strength to perform its function under the highest levels of loading that might reasonably be expected to occur.

3.3.2 *Impact Tests* — Tests to assess the strength of the furniture under the rapid rates of loading that occasionally occur.

3.4 Surface Finish Tests — Tests for surfaces of finished furniture to assess the resistance against given external conditions.

4 TYPE, DESIGN AND WORKMANSHIP

4.1 The chairs and stools have been categorised as follows:

1) Type 1: Dining, folding, easy chairs or stools etc, for domestic use.
2) Type 2: Training, conference, visitors cafeteria chairs and stools, including highchairs etc, for institutional use.

4.2 Design/model shall be as declared by the manufacturer.

4.3 The exposed/accessible edges and protruding parts shall be free from burrs, sharp edges and should be rounded or chamfered. The ends of accessible hollow components shall be closed or capped. Movable and adjustable parts shall be designed so that injuries and inadvertent operations are avoided. In case wooden components, the same shall be free from any stain, unless it is intended as part of design feature.

5 DIMENSIONS

The dimensions of chairs and stools shall be as per IS 3663 where applicable.

NOTE — Any other dimensions and design specifications of chairs and stools may be used as agreed between the manufacturer and the purchaser as per their requirements.

6 SURFACE PERFORMANCE

6.1 The test sample rigid surfaces shall be tested for tests for the following tests and shall qualify the minimum performance ratings specified in IS 17637.

a) Resistance to mechanical damage;
b) Pencil hardness;
c) Resistance to wet heat;
d) Resistance to dry heat;
e) Resistance to marking by cold liquids;
f) Resistance to marking by cold oils and fats; and
g) Adhesive performance.

The test samples for surface performance are to be tested on materials only and not on assembled chair.

6.2 Fabric and Leather (Synthetic and Natural) Performance

For fabric and/or leather (synthetic and natural) surfaces, the test sample surfaces shall be tested for the following tests and shall conform the minimum performance requirements specified in IS 17637.

a) *For Fabric and Synthetic Leather*
   1) Breaking load,
   2) Elongation at break,
   3) Tear strength,
   4) Colour fastness to light,
   5) Colour fastness to rubbing,
   6) Colour fastness to perspiration,
   7) Colour fastness to water,
   8) Pilling resistance,
   9) Coating adhesion strength,
   10) Seam slippage,
   11) Resistance to damage by flexing,
   12) Abrasion resistance,
   13) Bursting strength, and
   14) Resistance to cold.
b) *For Natural Leather*
   1) Tear strength,
   2) Flexing endurance,
   3) Finish adhesion,
   4) Colour fastness to artificial light,
   5) Colour fastness to rubbing,
   6) Colour fastness to water spotting,
   7) Water vapour permeability, and
   8) Colour fastness to water.

The test samples for surface performance are to be tested on materials only and not on assembled chair.

7 SAFETY REQUIREMENTS

7.1 The general test conditions and test apparatus requirements for the safety tests are given in Annex A and Annex B respectively**.**

7.2 Stability Test

7.2.1 *Forwards Overbalancing and Sideways Overbalancing for Chairs without Arms*

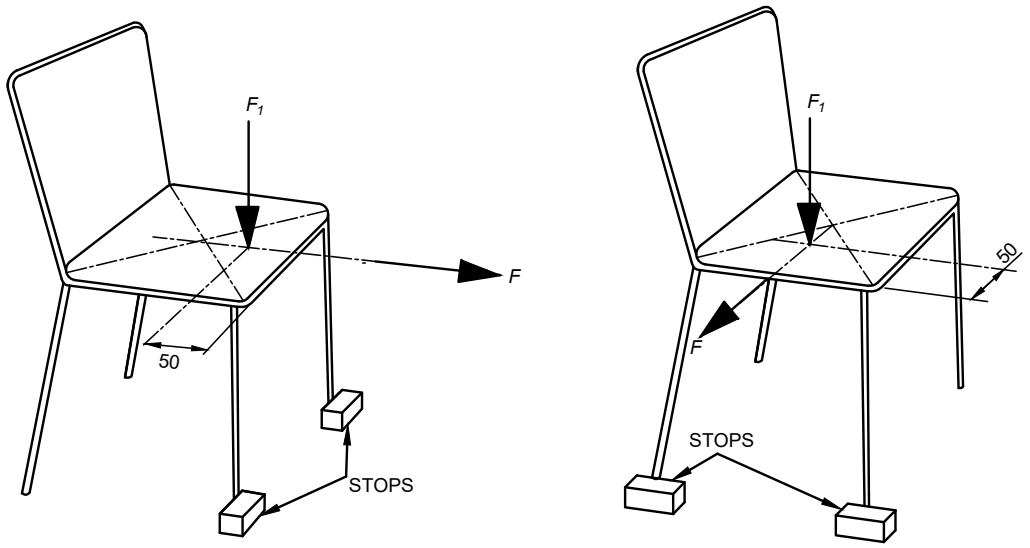
Position the chair with stops against the front legs and against the legs on one side (as appropriate). Apply a force (F_1) as specified in the Table 1 vertically by means of the seat loading pad (*see* **B-4**) to act at a point 60 mm from edge of the load bearing surface at those positions along its exposed periphery most likely to result in instability (usually tests on the centreline are sufficient). Apply a force (F), as specified in the Table 1 horizontally along a horizontal line extended forward from the point where the base of the loading pad meets the upper surface of the seat (*see* Fig. 1). For force application, smaller seat loading pad (*see* **B-5**) shall be used. In case the backrest or curvature of the seat interfering with the loading pad, another suitable device for applying the vertical force may be used like loading pin at the same positions.

Test for free swivelling chairs shall be repeated by rotating the seat base to the worst case scenario. Record and assess defects in accordance with **8.4**.

7.2.2 *Rearwards Overbalancing*

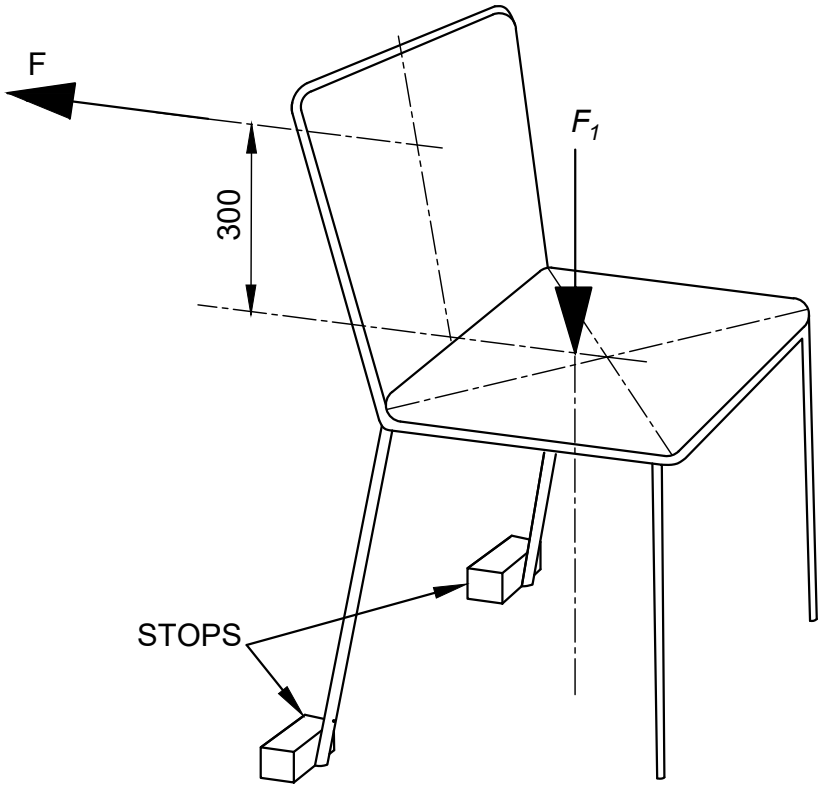
Position the chair with the stops (*see* **B-3**) against the rear legs. Apply a vertical force (F_1) as specified in the Table 1 to the seat by means of the loading pad on the seat point A determined with a help of the horizontal member of the loading point template Fig 23-Fig 25.

Apply a force (F) as specified in the Table 1 horizontally to the back of the chair at a height of the back point B determined with a help of the vertical member of the loading point template Fig 23-Fig 25 or at the top edge of the backrest, whichever is the lower (*see* Fig. 2). Free swivelling chairs shall be loaded on their axis of rotation. Record and assess defects in accordance with **8.4**.



All dimensions in millimetres

FIG. 1 FORWARDS OVERBALANCING AND SIDEWAYS OVERBALANCING FOR CHAIRS WITHOUT ARMS



All dimensions in millimetres

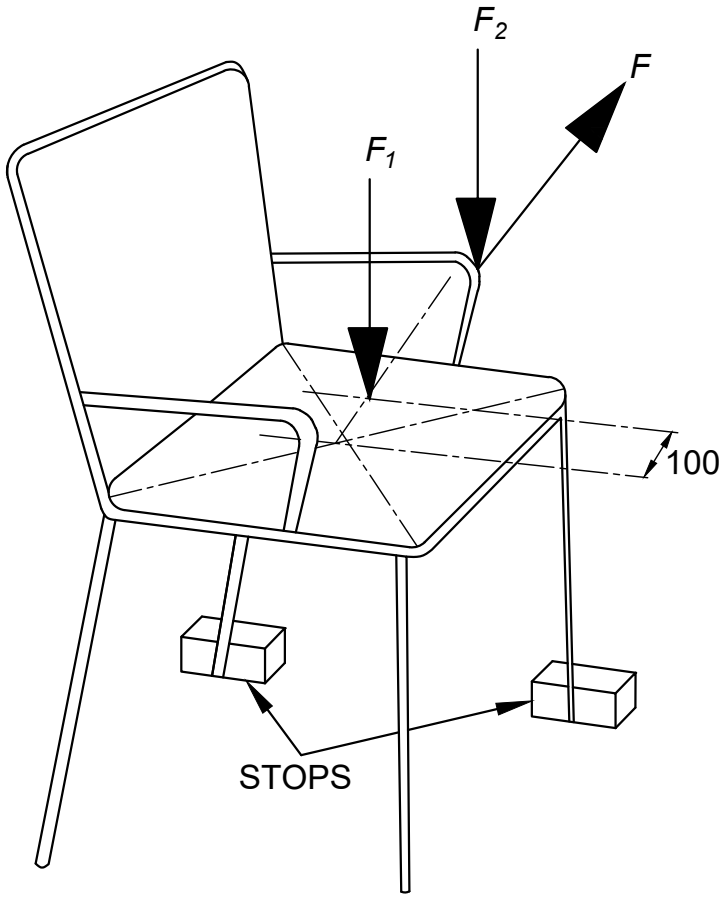
FIG. 2 REARWARDS OVERBALANCING

7.2.3 *Sideways Overbalancing for Chairs with Arms*

Position the chair with stops (*see* **B-3**) against the legs of one side. Apply a vertical force (F_1) as specified in the Table 1 at a point 100 mm to one side of the fore and aft centreline of the seat and between 175 mm and 250 mm forward of the rear edge of the seat. Apply a vertical force (F_2) as specified in the Table 1 by means of the loading pad at point maximum 40 mm inwards from the outside edge of the arm structure. Apply a horizontal force *F* as specified in the Table 1 outward at the upper surface of the arm rest and in line with the vertical arm force on the side with restrained feet (*see* Fig. 3). For force applications use smaller seat loading pad (*see* **B-5**) on the seat and suitable way of loading on the arm. Record and assess defects in accordance with **8.4**.

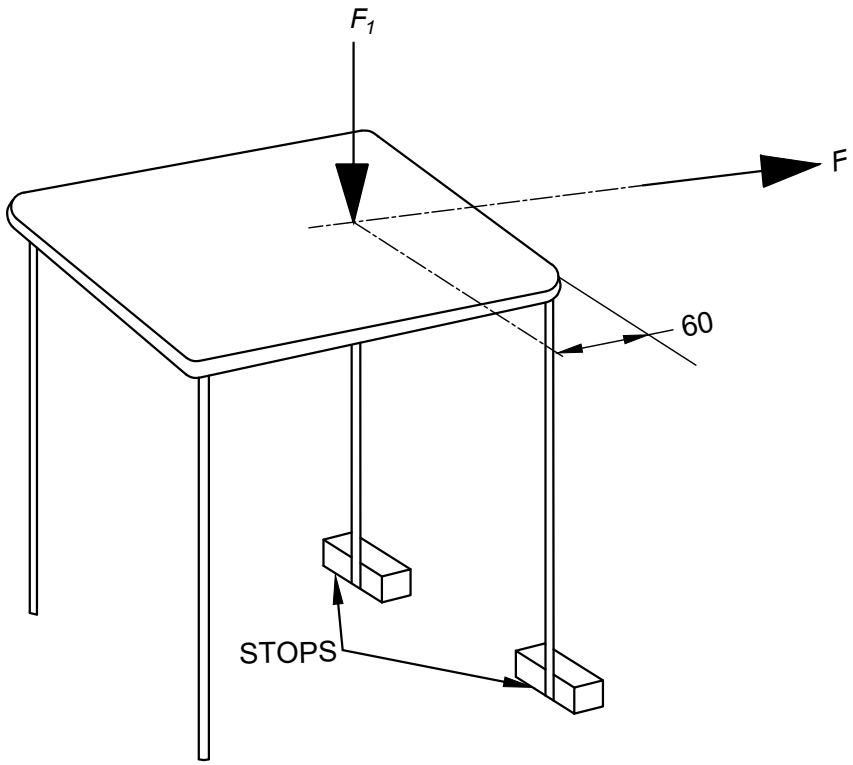
7.2.4 *Stools/ Poufs (All Directions)*

Position the stool so that two feet are resting against the stops (*see* **B-3**). Apply a vertical force (F_1) as specified in the Table 1 by means of the seat loading pad (*see* **B-4**) at a 60 mm from front edge of the load–bearing surface. Apply a horizontal force (*F*) as specified in the Table 1 through the centre of the seat in a direction towards the stopped feet (*see* Fig. 4). For force applications use smaller seat loading pad (*see* **B-5**). If it is not possible to identify the front or side of the article, test one additional side. Record and assess defects in accordance with **8.4**.



All dimensions in millimetres

FIG. 3 SIDEWAYS OVERBALANCING FOR CHAIRS WITH ARMS



All dimensions in millimetres

FIG. 4 STOOLS (ALL DIRECTIONS)

Table 1 Specifications of Test and Test Level – Stability

(*Clauses* 7.2.1, 7.2.2, 7.2.3 *and* 7.2.4)

Sl No.	Test	Force		
		Type	Magnitude	
			Type 1	Type 2
(1)	(2)	(3)	(4)	(5)
i)	Forward overbalancing	Downward force (F_1), N	600	600
		Horizontal force (F) , N	20	20
ii)	Sideways overbalancing for chair without arms	Downward force (F_1), N	600	600
		Horizontal force (F) , N	20	20
iii)	Rearwards overturning	Downward force (F_1), N	600	600
		Horizontal force (F) , N	80	80
iv)	Sideways overturning for chairs with arms	Downward force (F_1), N	250	250
		Downward force (F_2), N	350	350
		Horizontal force (F) , N	20	20
v)	Overbalancing in all sides stools/ poufs	Downward Force (F_1), N	600	600
		Horizontal Force (F) , N	20	20

7.3 Strength Test

7.3.1 *Static Load Test*

7.3.1.1 *Seat static load test*

Position the seat loading pad (*see* **B-4**) to the seat plane, first at the seat loading position determined by the chair loading position template (*see* Fig. 23 to Fig. 25), and subsequently at 100 mm back from front edge of the load–bearing surface of the seat. Apply the downward force (*F*) (*see* Fig. 5) for the number of cycles as specified in the Table 2. During each cycle, the force shall be maintained for minimum 10 s.

When it is not clear which of several positions of the loading pad is likely to cause failure, for example when testing pedestal and cantilever chairs, subject each of the positions to 10 cycles of the force specified above.

In the case of stools, apply the load along the fore and aft centre line of the seat at the seat loading position for stools determined by the chair loading position template. If necessary using the smaller seat loading pad (*see* **B-5**).

Record and assess defects in accordance with **8.4**.

7.3.1.2 *Back static load test*

Position the centre of the back-loading pad (*see* **B-7**) either at the back-loading position as specified by the chair loading position template (*see* Fig. 25) or at 100 mm below the top of the back, whichever is the lower. Prevent the chair from moving rearwards by placing stops behind the rear feet or castors.

The force (F_2) of the magnitude specified in the Table 2 shall be applied perpendicular to the back when under load. Conduct the test by the application of the force for the number of cycles as specified in the Table 2, with the balancing seat force (F_1) specified in the Table 2 applied at the seat loading position (*see* Annex C). During each application, the force shall be maintained for minimum 10 s.

If the chair tends to overbalance at this force, the force applied to the seat shall be increased until this tendency ceases.

NOTES

1 If it is not possible to apply the back load at the back-loading position due to the construction of the chair, for example, if the back is constructed of cross-members positioned above and/or below the back-loading position, a suitable panel may be used to spread the load over the back cross-members so long as this surface does not overlap the side upright members.

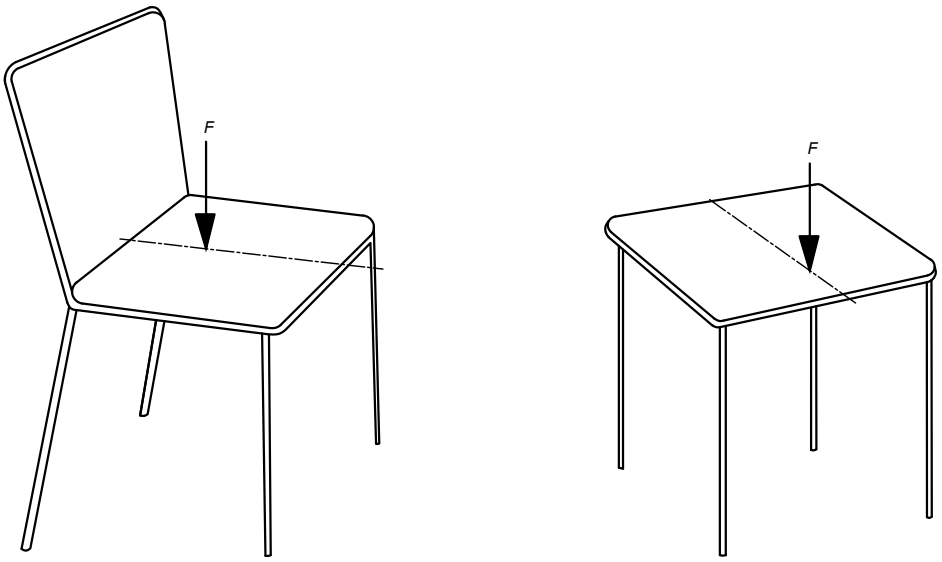


FIG. 5 SEAT STATIC LOAD TEST

When this test is applied to a stool (no backrest), or with a very low back rest (a low backrest means that it has a height of a maximum of 100 mm), apply the backward force (F_2) horizontally to the front edge of the seat. Regardless of the shape of the seat for stools with rectangular underframes, apply the force perpendicular to each of two adjacent sides in turn, half the number of applications of the force being applied to each side. For stools with triangular underframes, apply the force along each of any two median lines in turn. A low backrest means that it has a back height of a maximum of 100 mm measured from the uncompressed seat level near the back.

Record and assess defects in accordance with **8.4**.

NOTE — Since one position of the seat loading pad in the seat static load test is the same as that specified for the back-static load test, two tests together as a combined seat and back static load test can be performed. In this case, the seat load shall be applied first and then maintained while the back load is applied.

7.3.1.3 *Armrests/Wings sideways static load test*

Apply a pair of outward forces (F) of the same magnitude as specified in the Table 2, between the arms of the chair at the point along the arms most likely to cause failure (*see* Fig. 7). Apply the forces for number of cycles as specified in the Table 2, using the local loading pad (*see* **B-6**). During each cycle, maintain the load for minimum 10 s. If the chair has wings, that is two side pieces at the top of an armchair against which the head may be rested, repeat the test on both wings with the forces (F) of the same magnitude as specified in the Table 2.

Record and assess defects in accordance with **8.4**.

7.3.1.4 *Arm downwards static load test*

Apply a vertical force (F) of the magnitude and number of cycles as specified in the Table 2, at the point along the arms most likely to cause failure (*see* Fig. 8). Apply the force through the smaller seat loading pad (*see* **B-5**) and during each application, maintain the load for at least 10 s.

If the chair overbalances, apply a balancing load large enough to prevent the chair from overbalancing when the full force is applied, on the side of the seat opposite to that on which the full force is applied.

Record and assess defects in accordance with **8.4**.

NOTE — The arm sideways static load test can be combined with the arm downwards static load test by combining the horizontal and vertical loads (for each level) into a diagonal load, this being the resultant of the two loads.

7.3.1.5 *Leg forward static load test*

Restrain the front feet of the chair or stool from movement whilst applying a horizontal force centrally to the rear of the chair at seat level in a forward direction, by means of the local loading pad (*see* **B-6**). For stools with only three legs, one foot on the fore and aft centre line and one other foot should be restrained.

Apply the seat load (F_1) as specified in the Table 2 at the seat loading position specified by the chair loading position template (*see* Fig. 25). If the chair or stool tends to overbalance, reduce the load to a magnitude that just prevents forward overbalancing, and record the actual force used (*see* Fig. 9).

Apply the forward leg load (F_2) and number of cycles as specified in the Table 2, and during each application, maintain the load for at least 10 s.

Record and assess defects in accordance with **8.4**.

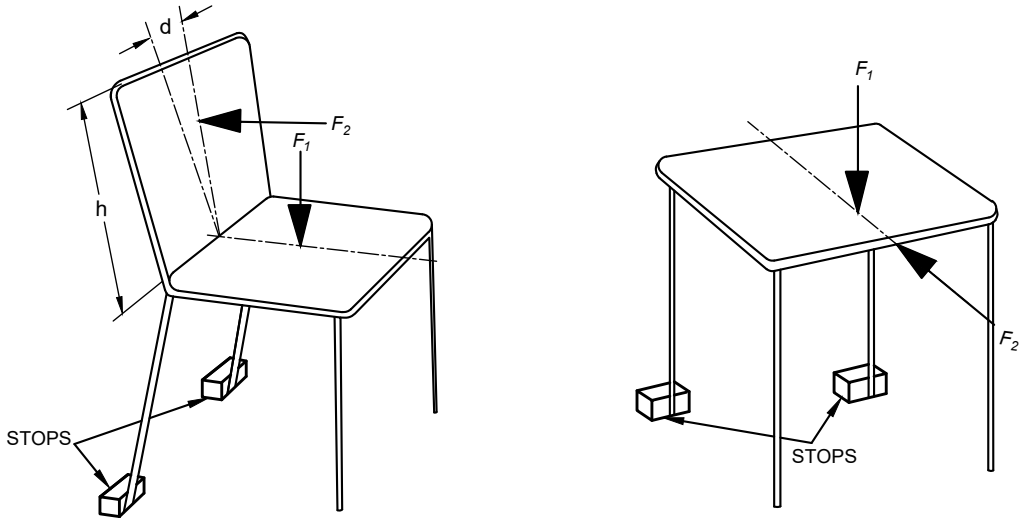


FIG. 6 BACK STATIC LOAD TEST

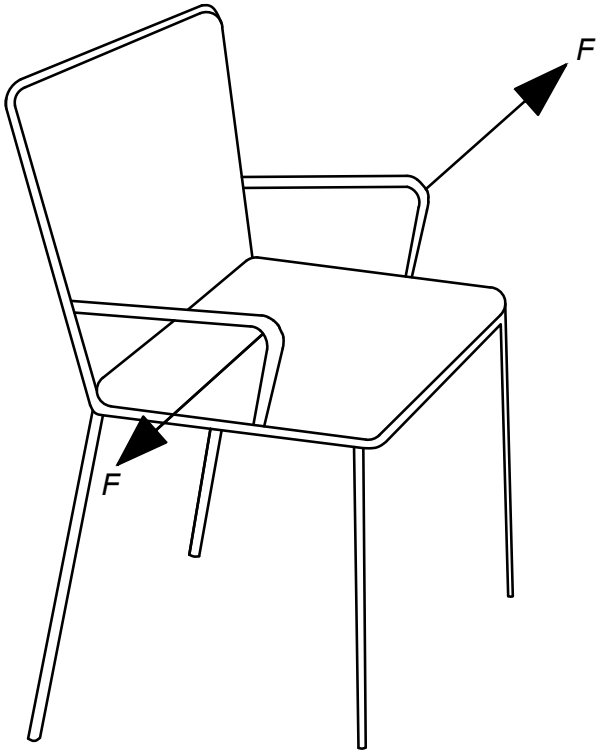


FIG. 7 ARM REST/WINGS SIDEWAYS STATIC LOAD TEST

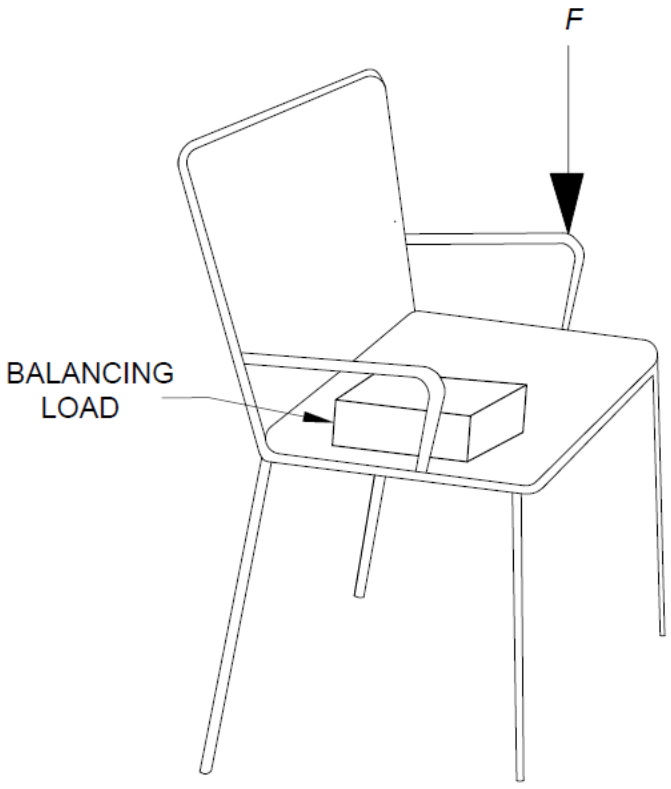


FIG. 8 ARM DOWNWARDS STATIC LOAD TEST

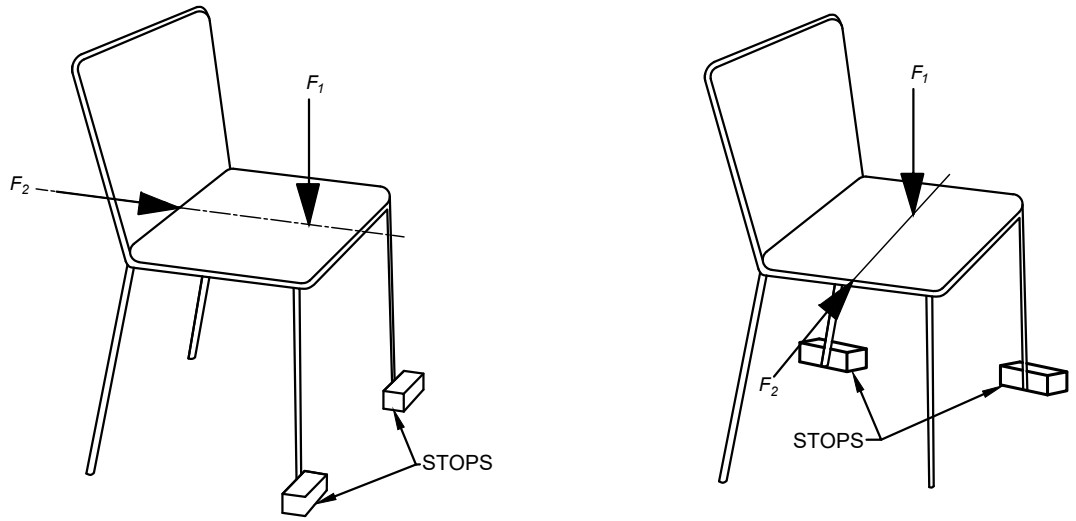


FIG. 9 LEG STATIC LOAD TEST

7.3.1.6 *Leg sideways static load test*

Carry out this test in the same manner as the leg forward static loading test except restrain a pair of front and rear feet from movement whilst applying a horizontal force centrally to the side of the article at seat level, in a sideways direction towards the restraining feet. Apply the vertical force (F_1) as specified in the Table 2 at a suitable position across the seat but not more than 150 mm from the unloaded edge of the seat. Apply the horizontal force (F_2) and for number of cycles as specified in Table 2, and during each application, maintain the load for at least 10 s (*see* Fig. 9).

If the chair tends to overbalance with the vertical seat load in its furthermost position from the unloaded edge, reduce the horizontal seat loading force to a magnitude that just prevents sideways overbalancing, and record the actual force used.

NOTE — Leg tests are applicable to chairs and stools with legs or pedestals. There are no rearward leg loading tests because proof of durability when subjected to them will have been demonstrated in the back static loading test (**7.3.1.2**). Similarly, the leg tests need not be applied to stools without backrests and without an obvious front and rear, because proof of the performance of the stool when subjected to them will have been demonstrated in the back static loading test (**7.3.1.2**).

For stools with backrests and those with shaped seats so that the front and rear of the stool are obvious, the leg tests shall be applied as for chairs. Where such a stool has only three legs, one foot on the fore and aft centre line of the stool and one other foot shall be provided with stops in the sideways loading test. Chairs without legs or pedestals shall be subjected to the diagonal base load test (**7.3.1.7**)

Record and assess defects in accordance with **8.4**.

7.3.1.7 *Diagonal base load test*

The diagonal base test shall be applied to chair or stools without pedestal or legs (supported by studs or shoe component not longer than 60 mm and height to width ratio of not more than 2 : 1). Chairs with pedestals or legs shall be subjected to the leg static load tests (*see* **7.3.1.5** and **7.3.1.6**).

Apply simultaneously two opposing forces (F) of the same magnitude and for number of cycles as specified in the Table 2, to one pair of diagonally opposite corners of the article. Apply the forces as near as possible to the lowest point, in an inward direction. During each application, maintain the load for at least 10 s (*see* Fig. 10).

Record and assess defects in accordance with **8.4**.

7.3.1.8 *Foot rest static-load test*

Apply a vertical force F as specified in Table 2 by the mean of the local loading pad (*see* **B-6**), acting 80 mm from front edge of the load bearing structure of the foot rest at those points most likely to cause failure. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section. If the chair tends to overturn, load the seat to prevent overturning and report this test.

Record and assess defects in accordance with **8.4**.

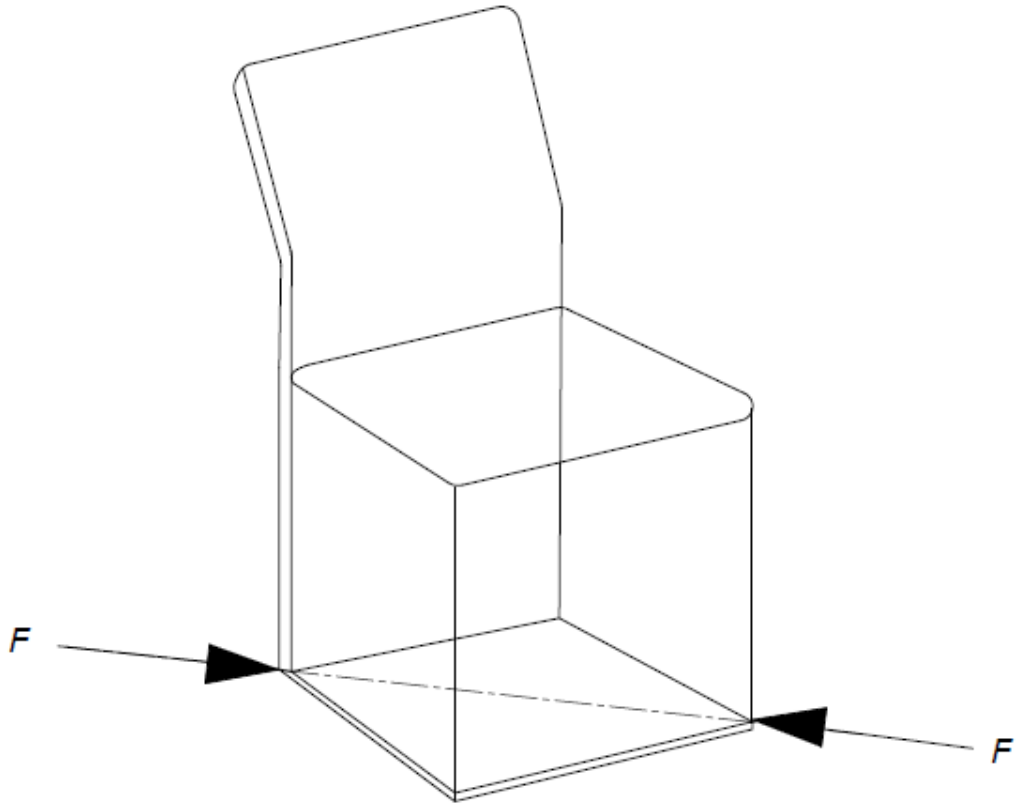


FIG. 10 DIAGONAL BASE LOAD TEST – DIRECTIONS OF FORCES

7.3.2 *Impact Test*

7.3.2.1 *Seat impact test*

Place a piece of foam (*see* **B-8**) on the seat.

Allow the seat impactor (*see* **B-9** and Fig. 21) to fall freely from the drop height *H* as specified in the Table 2 onto the seat loading position as specified by the chair loading position template (*see* Annex C and Fig. 11). Repeat this test for the number of cycles as specified in the Table 2. Repeat at any other position if considered likely to cause failure.

In the case of soft upholstery, calculate the height of fall when the seat is loaded with a mass of 2 kg by means of the smaller seat loading pad (*see* **B-5**).

Record and assess defects in accordance with **8.4**.

7.3.2.2 *Back impact test*

Carry out the test with the impact hammer (*see* **B-10**).

Place the chair or stool with its front feet prevented by stops (*see* **B-3**) from moving forward.

Strike the outside of the chair back top at its centre, or, when there is no back, the centre of the seat rear edge horizontally with the impact hammer falling from a drop height (*H*) and the number of cycles as specified in the Table 2.

If a stool has no easily determined rear edge, apply the test in the direction most likely to cause the stool to tip over.

If the chair has wings, rearrange the position of the chair and repeat the test with the striker hitting the outside of the top of one wing at right angles to the surface and in the position most likely to cause failure. Restrain the legs of the opposite side.

Record and assess defects in accordance with **8.4**.

7.3.2.3 *Arm impact test*

Carry out the test in the same manner as the back impact test (*see* **7.3.2.2**) except that the impact shall be applied in an inward direction to the outside face of one arm at the position most likely to cause a failure (*see* Fig. 13). The drop angle (A) and number of cycles as specified in Table 2.

Record and assess defects in accordance with **8.4**.

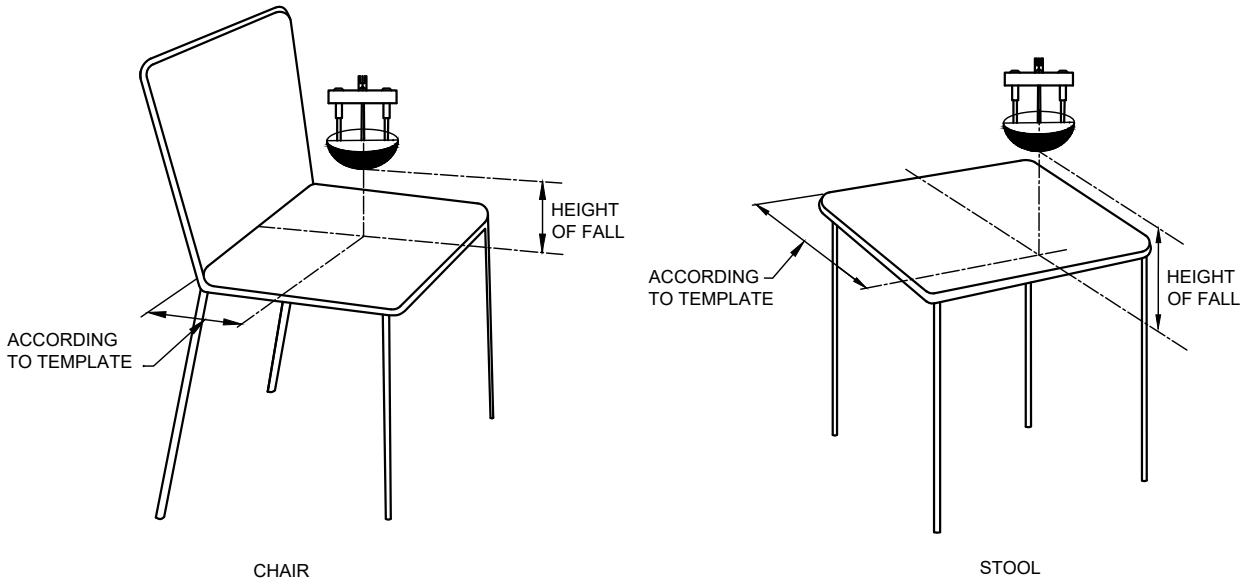


FIG. 11 SEAT IMPACT TEST

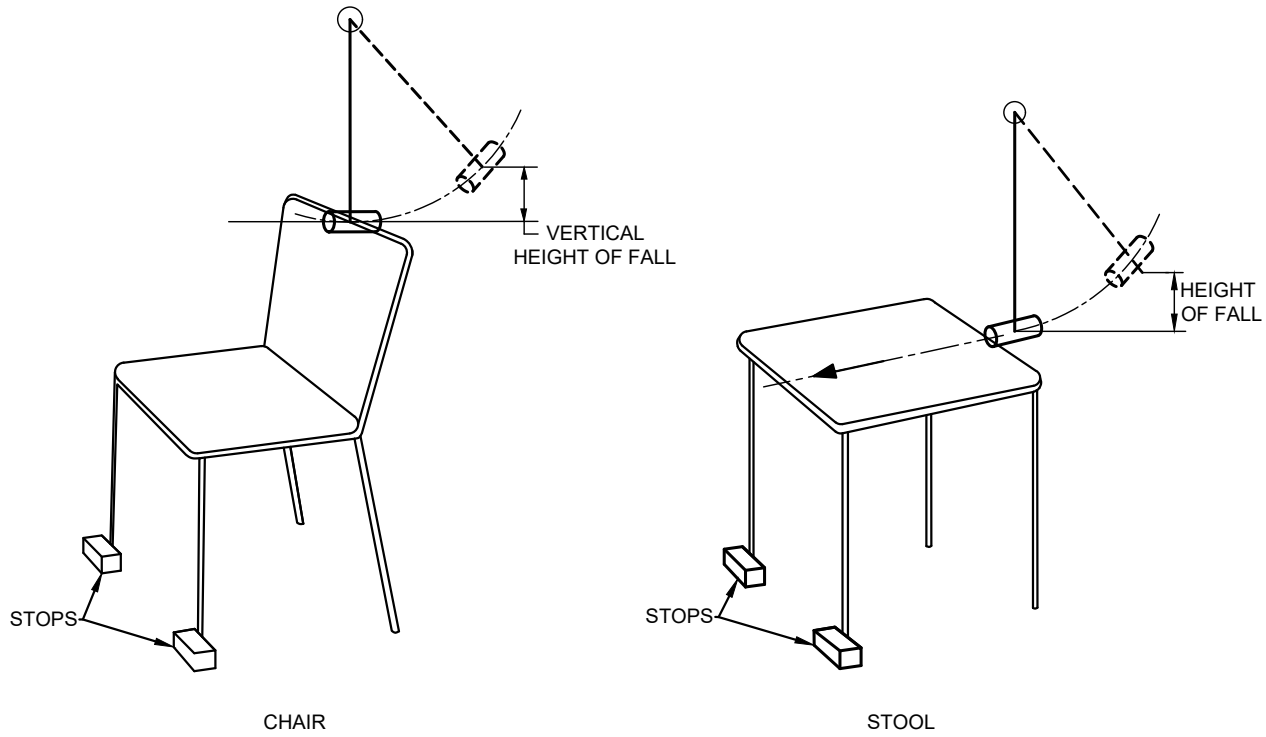


FIG.12 BACK IMPACT TEST

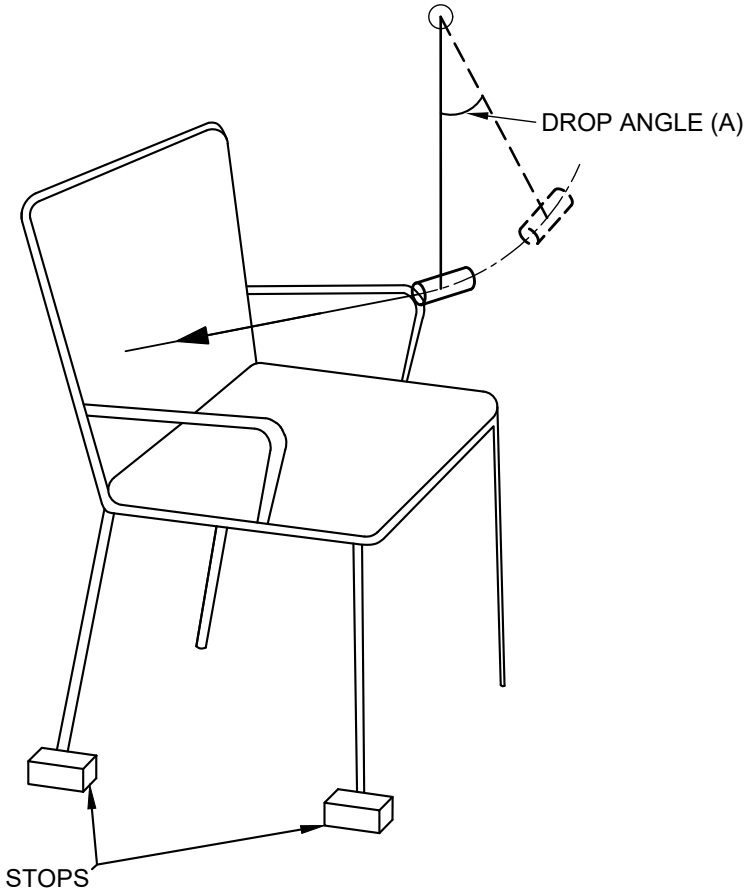


FIG. 13 ARM IMPACT TEST

7.3.2.4 *Drop test*

Support the chair or stool so that, at impact on one foot, the line joining that foot to the foot diagonally opposite is inclined at 10° to the horizontal, whilst the line joining the remaining feet is horizontal. In the case of three-legged stools, support the stool so that the line joining two feet shall be horizontal and the line from the third foot, that is, the one receiving impact, to the mid-point of the line is inclined at 10° to the horizontal (*see* Fig. 14).

Lift up the article to the height as specified in the Table 2 for the type of leg or pedestal fitted to the article. Drop the chair or stool onto a front leg and a rear leg each for number of cycles as specified in Table 2, onto the standard floor (*see* **B-2**). In case of star shape chair or stool, the front and back leg shall be as defined on Fig. 15.

NOTE — This test may be carried out by lifting the chair or stool by three cords that are adjusted in length with the article standing in the correct orientation on a plane inclined at 10° to the horizontal.

Record and assess defects in accordance with **8.4**.

7.4 Durability Test

7.4.1 *Seat Fatigue Test*

Apply the force (F) by means of the seat loading pad (*see* **B-4**) with the centre of the loading pad positioned at the seat loading position determined as in the Annex C. Apply the force for the number of cycles as specified in Table 3 at a rate not exceeding 40 cycles per minute (*see* Fig. 16).

7.4.2 *Back Fatigue Test*

Position the centre of the back-loading pad (*see* **B-7**) either at the back-loading position determined as in the Annex C, or at 100 mm below the top of the back, whichever is lower. Prevent the chair from moving rearwards by placing stops behind the rear feet or castors. Conduct the test by the repeated application of a force (F_1), or if the chair overbalances, of such lesser force as to just prevent rearwards overbalancing. Carry out the test at a rate not exceeding 40 cycles per minute for the appropriate number of applications specified in the Table 3. During each cycle apply a force (F_2) to the seat (*see* Fig. 17).

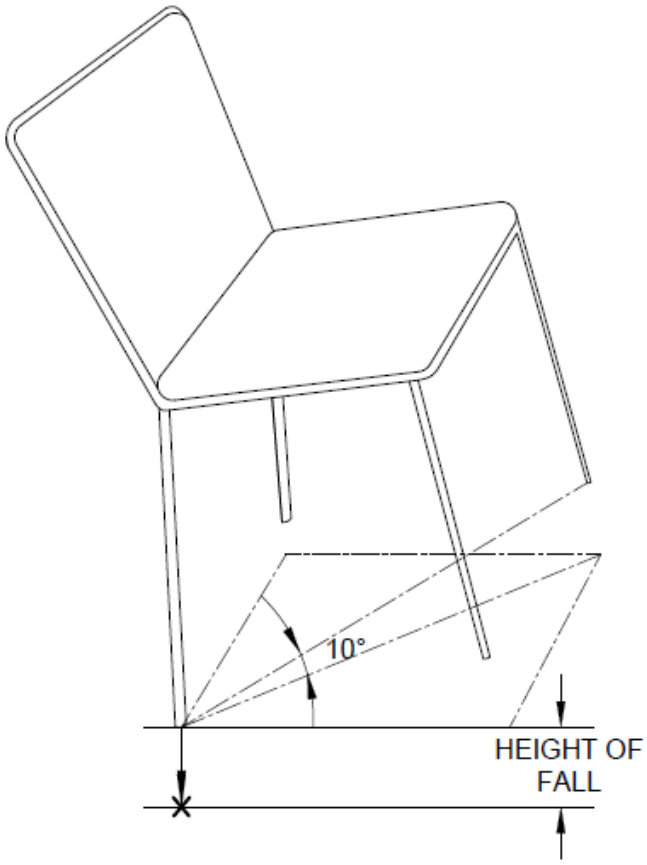


FIG. 14 DROP TEST

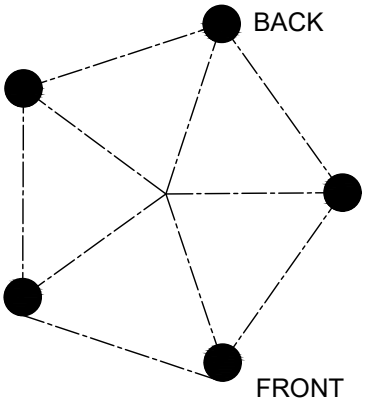


FIG. 15 LEG ARRANGMENT OF STAR SHAPED CHAIR OR STOOL

Table 2 Test Requirements – Strength Test

(*Clauses* 7.3.1.1, 7.3.1.2, 7.3.1.3, 7.3.1.4, 7.3.1.5, 7.3.1.6, 7.3.1.7, 7.3.1.8, 7.3.2.1, 7.3.2.2, 7.3.2.3 *and* 7.3.2.4)

Sl No.	Test	Force/Height/Angle			Number of Cycles
		Type	Magnitude		
			Type 1	Type 2	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Seat static load test	Downward Force (F), N	1 100	1 300	10
ii)	Back static load test	Downward Force (F_1), N	1 100	1 300	10
		Horizontal Force (F_2), N	410	560	–
iii)	Arm rests/Wings sideways static load test	Horizontal Force (F), N	300 (arm rests) 200 (wings)	400 (arm rests) 300 (wings)	10
iv)	Arm downwards static load test	Downward Force (F), N	700	800	10
v)	Leg forward static load test	Downward Force (F_1), N	780	1000	10
		Horizontal Force (F_2), N	375	500	
vi)	Leg sideways static load test	Downward Force (F_1), N	780	1000	10
		Horizontal Force (F_2), N	300	390	
vii)	Diagonal base load test	Horizontal Force (F), N	250	375	10
viii)	Foot rest static load test	Downward Force (F), N	1000	1100	10
ix)	Seat Impact test	Drop height (H), mm	140	180	10
x)	Back Impact Test	Drop height (H), mm	120	210	10
xi)	Arm Impact Test	Drop angle (A), Degree	28	38	10
xii)	Drop Test (at 10 degrees)				
	a) Stackable or special design of chairs and stools with legs or pedestals longer than 200 mm	Drop height, mm	300	450	10
	b) Non-Stacking chairs with castors or swivelling glides with legs or pedestals longer than 200 mm	Drop Height, mm	150	200	10
	c) Chairs and stools with legs or pedestals shorter than 200 mm	Drop height, mm	75	100	10

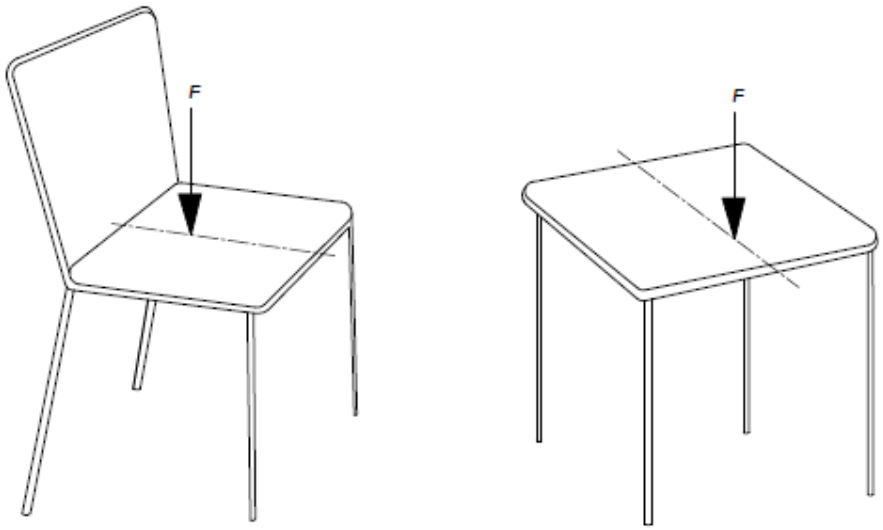


FIG. 16 SEAT FATIGUE TEST

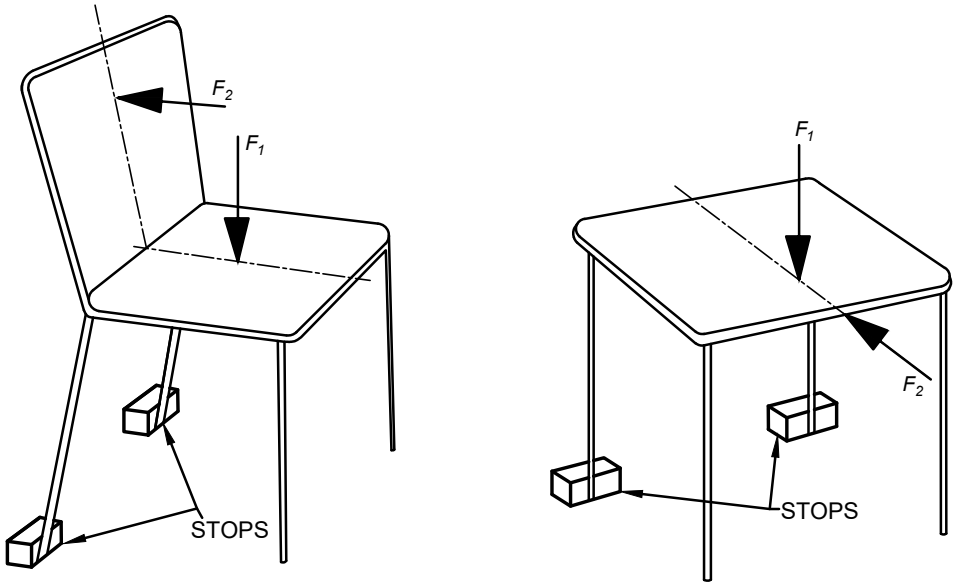


FIG. 17 BACK FATIGUE TEST

When this test is applied to a stool without a back rest, or with a very low back, apply the backward force horizontally to the front edge of the seat. Test stools with four legs on which the seat surface is not symmetrical both with the seat major dimensions sideways, and with the major dimensions fore and aft for half the number of applications of the force in each of the two directions. Test stools with three legs along two of the principle axes of the three feet. A low backrest means that it has a height of a maximum of 100 mm measured from the uncompressed seat level near the back.

NOTE — As the number of cycles and the seat load are common to both the seat and back fatigue tests it is normally convenient to perform these two tests together as a combined seat and back fatigue test. In this case. the seat load should be applied first and then maintained while the back load is applied.

7.4.3 *Arm Rest Durability*

Apply simultaneously and cyclically the force on each arm rest at points 100 mm behind the foremost point of the arm rest length. Using the apparatus shown in principle in Fig. 19, apply a force (F) through the smaller seat loading device (*see* **B-5**). With this force applied, adjust the apparatus so that each arm of the test apparatus has an angle of 10° ± 1° to the vertical. The length of the arm of the test apparatus shall be 600 mm ± 10 mm. The arm rests shall be allowed to deform freely. The forces to be applied and their number of cycles shall be as given in Table 3.

8 SAMPLING AND CRITERIA OF CONFORMITY

8.1 All chairs or stools of same model/design and manufactured from same raw materials offered for inspection shall constitute a lot.

NOTE — Chairs or stools made in different colours are considered to be the same lot.

8.2 The required number of chairs shall be selected at random and depend upon the size of the lot.

8.3 The sample selected as per **8.2** shall be subjected to the tests as per **5, 6** and **7** as applicable. The lot shall be declared as conforming to the requirements of this standard, if the sample meets the requirements of all the tests mentioned therein.

8.4 The criteria of the conformity for the tests as per **6** shall be same as specified therein. However, for the tests as per **7**, the criteria of conformity shall be as follows:

1) No damage/deformation or wear of any part or component such that its functioning is impaired. The structural element should not be deformed in a way that there is loss of serviceability.
2) No overturning of chair and stool for stability tests as per Table 1 and for chairs and stools undergone durability tests;
3) No fractures/breakage of any member, joint or component;
4) No loosening of joints intended to be rigid or that its function is impaired; and
5) Audible noise developed during testing shall be less than 80 dB.

9 MARKING

9.1 Each chair/stool shall be indelibly and legibly marked with the following particulars:

a) Manufacturer's name, brand name or his recognized trade mark, if any;
b) Date of manufacture;
c) Design/Model Number (as declared by the manufacturer); and
d) Batch/lot number.

9.2 Each chair or stool meant to be assembled by the customer shall have the instruction for assembly provided as a leaflet and/or available in digital document file.

9.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

Table 3 Specifications of Test and Test Level – Durability Test

(*Clauses* 7.4.1, 7.4.2 *and* 7.4.3)

Sl No.	Test	Force		Cycles	
		Type	Magnitude	Type 1	Type 2
(1)	(2)	(3)	(4)	(5)	(6)
i)	Seat fatigue test	Downward Force (F), N	950	50 000	1 00 000
ii)	Back fatigue test	Downward Force (F_1), N	950	–	–
		Horizontal Force (F_2), N	330	50 000	1 00 000
iii)	Arm rest durability	Horizontal Force (F), N	400	10 000	40 000

ANNEX A

(*Clause* 7.1)

GENERAL TEST CONDITIONS

A-1 PRELIMINARY PREPARATION

The furniture unit shall be tested as delivered or it shall be assembled according to the instructions supplied with it. If the furniture can be assembled or combined in different ways, the most adverse configuration intended for use shall be used for each test. If mounting or assembly instructions are not supplied, the assembly method shall be recorded in the test report. Fittings shall be tightened before testing and shall not be retightened unless specifically required by the manufacturer.

All the safety tests shall be carried out on the same sample. The tests shall be carried out in indoor ambient conditions in the range of 15 °C to 35 °C. For furniture products including hygroscopic materials it needs to be to conditioned to ambient environment's relative humidity prior to testing.

Levelling devices shall be opened to their midpoint of adjustment, but not more than 10 mm. During testing, the unit shall be placed on the floor and levelled, unless otherwise specified.

Before beginning the testing, visually inspect the unit thoroughly.

Record any defects so that they are not assumed to have been caused by the tests.

A-2 APPLICATION OF FORCES

The test forces in the static load tests shall be applied slowly enough to ensure that negligible dynamic force is applied. Unless otherwise indicated, each force shall be maintained for (10 ± 2) s. Unless otherwise specified, the number of cycles for each static load test shall be considered as one.

The test forces in durability tests shall be applied at a rate such that excessive heating does not occur. Unless otherwise specified, each test force shall be maintained for (2 ± 1) s.

The forces may be replaced by masses. The relationship 10 N = 1 kg shall be used.

A-3 TOLERANCES

The following tolerances are applicable:

a) Forces : ± 5 percent of the nominal force;

b) Masses : ± 1 percent of the nominal mass;

c) Dimensions : ± 5 mm of the nominal dimension on soft surfaces and ± 2 mm of the nominal dimension on all other surfaces; and

d) Angles : ± 2° of the nominal angle.

The accuracy for the position of loading pads and impactor shall be ± 5 mm.

A-4 SEQUENCE OF TESTING

All applicable tests as mentioned in **7** shall be carried out on the same sample and in the sequence as the clauses are numbered in the standard. Stability test shall be repeated also after durability test.

ANNEX B

(*Clauses* 7.1, 7.2, 7.3 *and* 7.4)

TEST APPARATUS

B-1 GENERAL

The equipment shall not inhibit deformation nor cause unnatural deformation of the unit/component, that is it shall be able to move such that it can follow the deformation of the unit/component during testing.

All loading pads shall be capable of pivoting in all directions. The pivot point shall be as close as practically possible to the load surface.

B-2 TEST FLOOR SURFACE

Horizontal, flat. For the drop test (*see* **7.3.2.4**) a rubber mat 2 to 3 mm thick, with hardness 85 ± 10 IRHD according to IS 3400 (Part 2), on a concrete floor.

B-3 STOPS

Stops are devices to prevent the article from sliding but not tilting, no higher than 12 mm except in cases where the design of the item necessitates the use of higher stops, in which case the lowest that will prevent the item from moving shall be used.

B-4 SEAT-LOADING PAD

The seat-loading pad is a naturalistically shaped rigid indenter with a hard, smooth surface (*see* Fig. 18).

B-5 SMALLER SEAT-LOADING PAD

The smaller seat-loading pad is rigid circular object 200 mm in diameter the face of which has a convex spherical curvature of 300 mm radius with a 12 mm front edge radius (*see* Fig. 19).

B-6 LOCAL LOADING PAD

The local loading pad that is, for arm and leg loading test), rigid cylindrical object 100 mm in diameter, with a flat face and a 12 mm radius on the front edge.

B-7 BACK-LOADING PAD

The back loading pad, rigid rectangular object 200 mm high and 250 mm wide the face of which is curved across the width of the pad with a convex cylindrical curvature of 450 mm radius and with a 12 mm radius on all front edges (*see* Fig. 20).

B-8 FOAM FOR FACING LOADING PADS

A 25 mm thick layer of polyurethane foam with an indentation hardness index of 135 ± 40 N when measured according to method A of IS 16774 and a density of 27 to 30 kg/m^3.

B-9 SEAT IMPACTER (*see* Fig. 21)

The seat impactor is a circular body, approximately 200 mm in diameter separated from the striking surface by helical compression springs and free to move relative to it on a line perpendicular to the plane of the central area of the striking surface.

The body and associated parts minus the springs shall have a mass of (17 ± 0.1) kg and the whole apparatus, including mass, springs and striking surface, shall have a mass of (25 ± 0.1) kg.

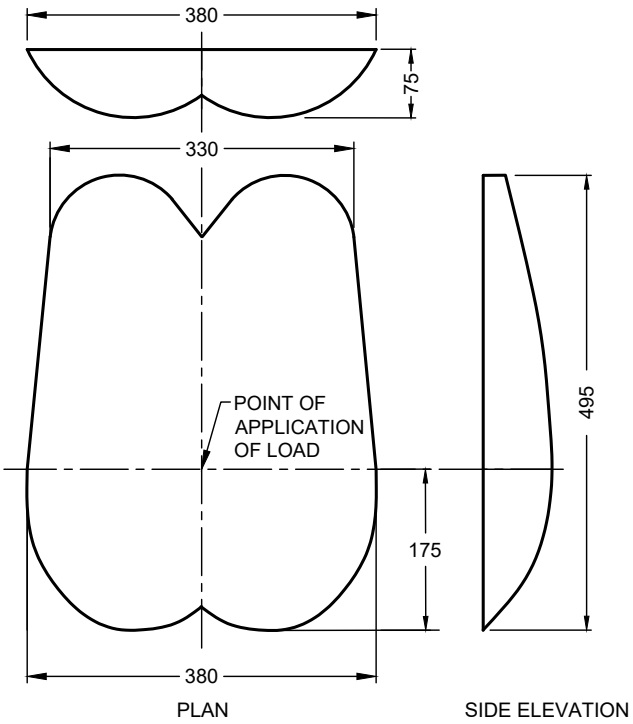
Springs, which shall be such that the combined spring system has a nominal spring rate of (0.69 ± 0.1) kg/mm and the total friction resistance of the moving parts is between 0.025 kg and 0.045 kg. The spring system shall be compressed to an initial load of 104 ± 0.5 kg (measured statically) and the amount of spring compression movement available from the initial compression point to the point where the springs become fully closed shall be not less than 60 mm.

Striking surface, shall be approximately flat leather pad containing fine dry sand.

B-10 IMPACT HAMMER

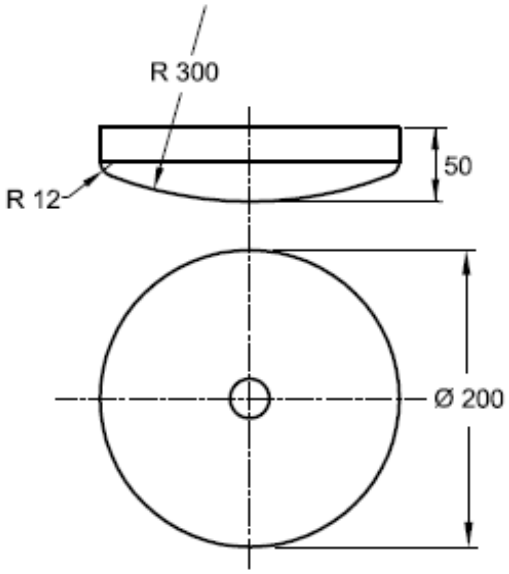
The impact hammer is a cylindrical object having a mass of 6.5 kg, supported from a pivot by a steel tube of 38 mm in diameter and with a wall thickness of 1.6 mm. The distance between the pivot and the centre of gravity of the striker is 1 m. The pendulum arm is pivoted by a low friction bearing (*see* Fig. 22).

B-11 Chair loading position template, shall be as described in the Annex C.



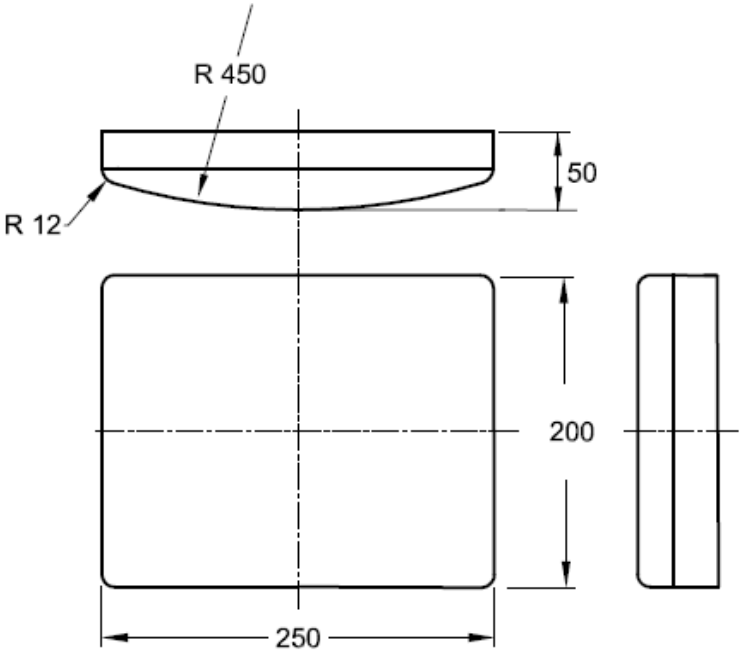
All dimensions in millimetres

FIG. 18 DETAILS OF THE NATURALISTICALLY SHAPED STANDARD SEAT LOADING PAD



All dimensions in millimetres

FIG. 19 DETAILS OF SMALLER SEAT LOADING PAD



All dimensions in millimetres

FIG. 20 DETAILS OF BACK LOADING PAD

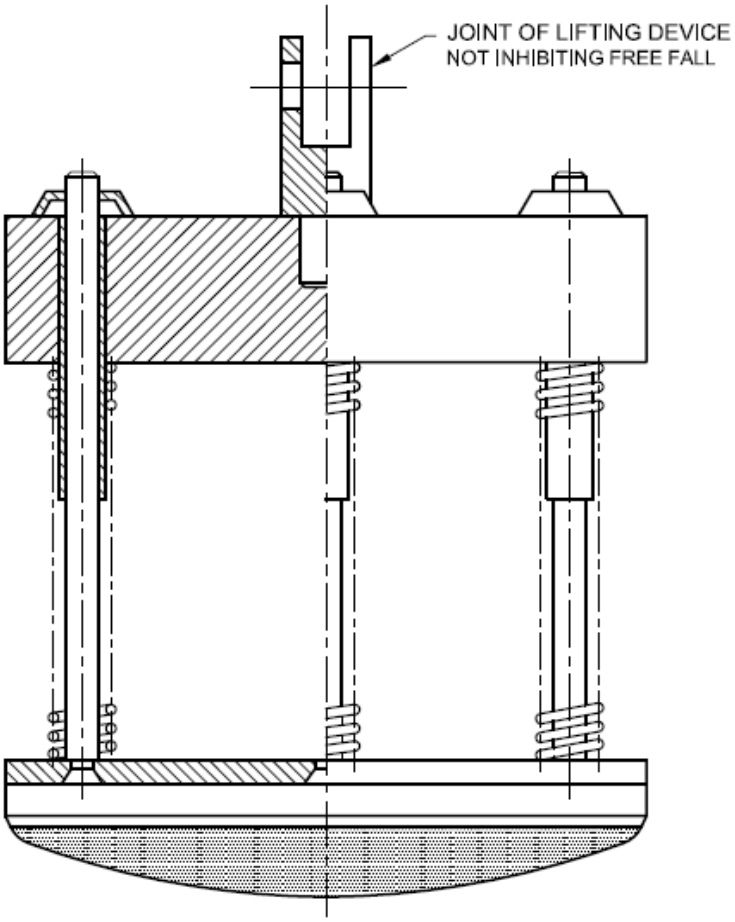
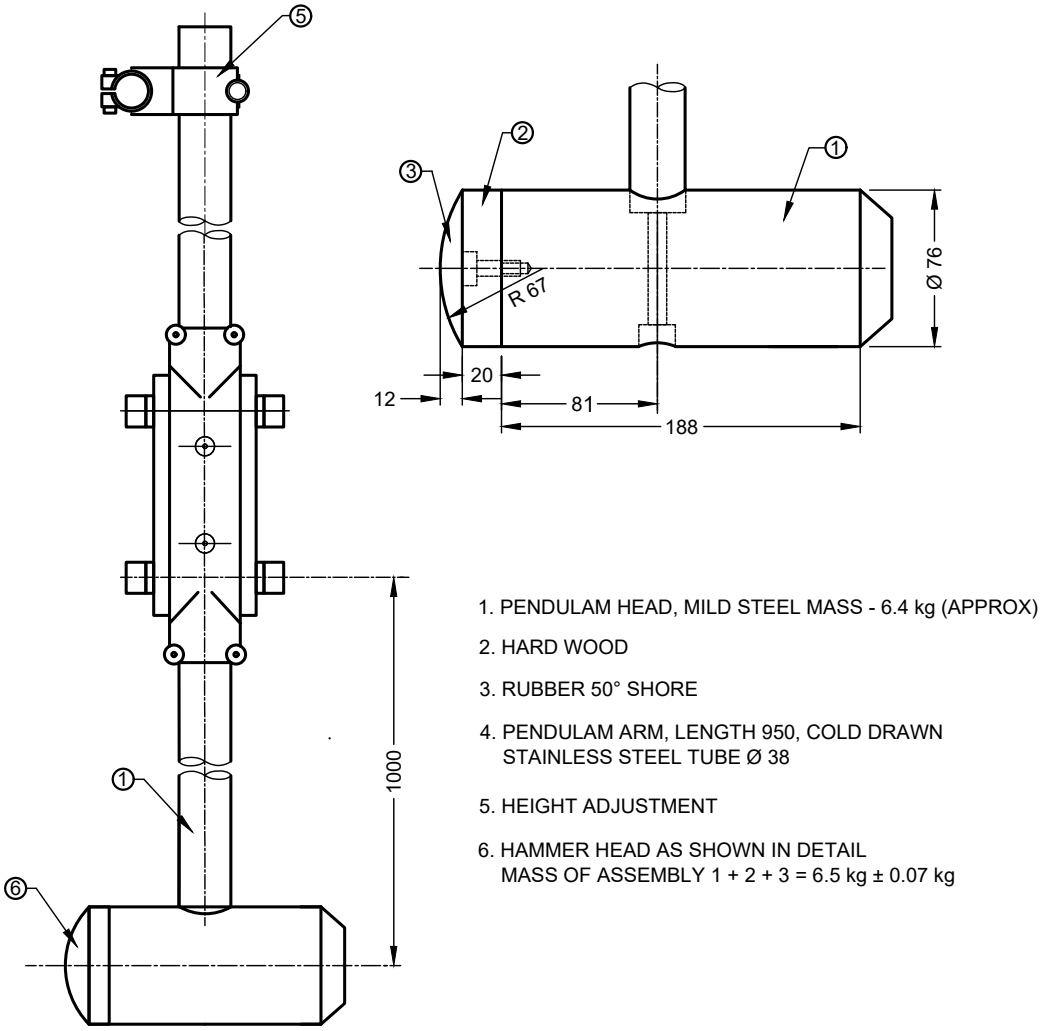


FIG. 21 DETAILS OF SEAT IMPACTOR



All dimensions in millimetres

FIG. 22 DETAILS OF PENDULUM IMPACT HAMMER

ANNEX C

(*Clauses* 7.3.1.2, 7.3.2.1, 7.4.1. 7.4.2 *and* B-11)

DETERMINATION OF SEAT AND BACK LOADING POSITIONS

C-1 INTRODUCTION

This method determines the seat and back loading positions that are specified in this standard as distances measured from the seat and back intersection point. The determination of alternative loading points measured from the front edge of the seat or the top of the back is carried out in the normal manner.

C-2 APPARATUS

A chair loading position template (*see* Fig. 23 and Fig. 24) consisting of two shaped members fastened together by a pivot at one end. The contours of the shaped surfaces are so devised as to sink into the upholstery for a representative distance and at moderate loads. For this purpose, the seat loading arm shall have a total mass of 20 kg, applied through the seat loading point.

The apparatus is marked as shown in Fig. 23 so that the template can be positioned easily with the two members at 90° to each other. Loading points A and B correspond to those points on a chair being 175 mm forward of the seat and back intersection point on the seat and 300 mm upward from the seat and back intersection point on the back.

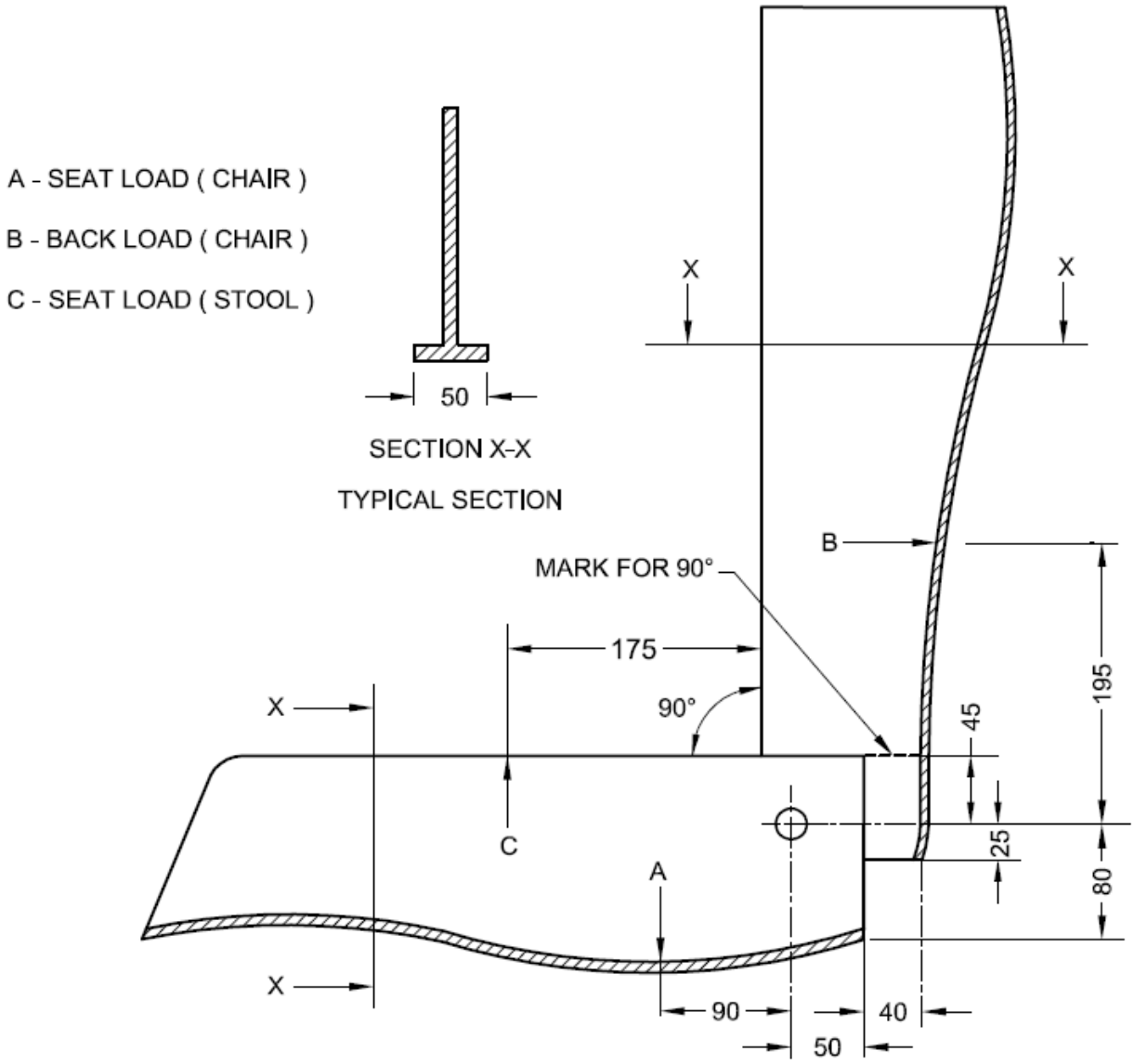
C-3 METHOD

C-3.1 Chairs

Position the template with its load applied at the seat loading point on the centreline of the chair as far towards the rear as possible. Adjust its position by pushing the back-loading portion into the back, so levering the seat portion forwards until the shape of the template correlates to that of the chair (*see* Fig. 25). Mark the required loading positions from the template.

C-3.2 Stools

Set up the apparatus at 90° with the aid of the mark as shown in Fig. 23. Place on the stool as shown in Fig. 25. Mark the required loading position from the template.



All dimensions in millimetres

FIG. 23 CHAIR LOADING POSITION TEMPLATE

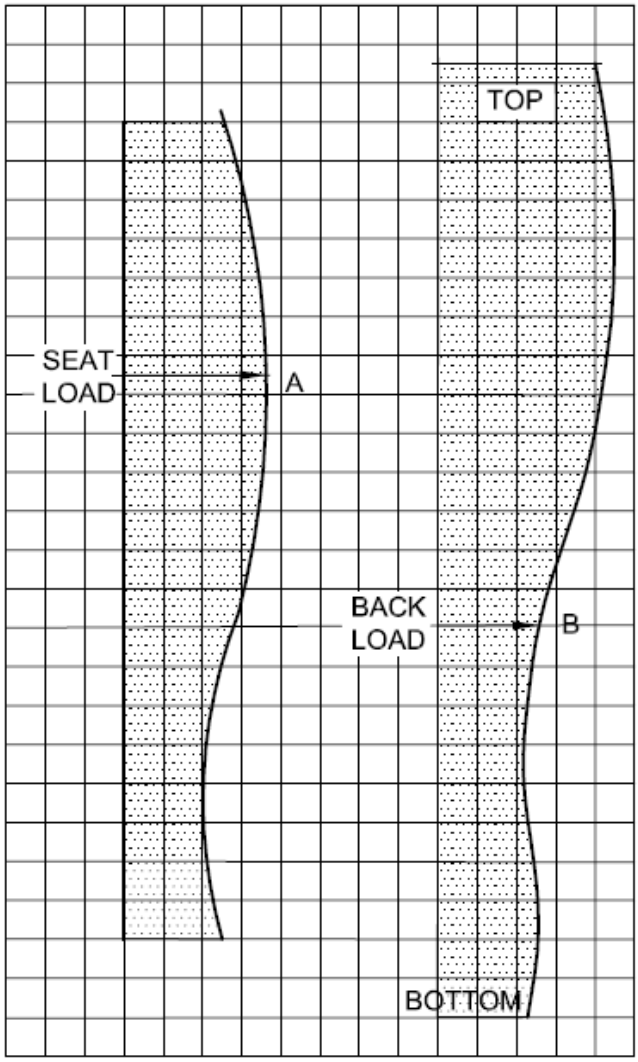


FIG. 24 LOADING SURFACE CURVES FOR CHAIR AND BACK LOADING TEMPLATE ASSEMBLY

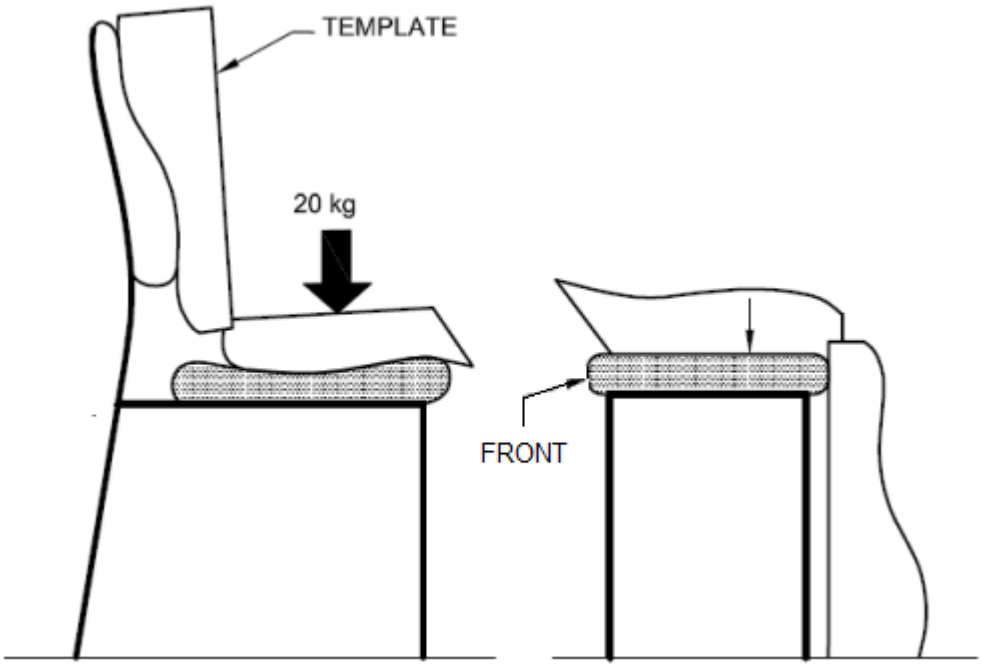


FIG. 25 POSITION OF CHAIR LOADING POSITION TEMPLATE ON CHAIRS AND STOOLS

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Furniture Sectional Committee, CED 35

Organization	*Representative(s)*
In Personal Capacity (*II A, K-11, Ground Floor, Kailash Colony, New Delhi 110048*)	Shri Balbir Verma (***Chairman***)
Association of Furniture Manufacturers and Traders (I), Mumbai	Representative
Blowplast (BP) Ergonomics Ltd, Mumbai	Dr Nitin Sudame Dr Gita Piramal (*Alternate*)
Central Public Works Department, New Delhi	Shri A. K. Sharma Shrimati Nandni Mukopadhyay (*Alternate*)
Centre for Environmental Planning and Technology (CEPT) University, Ahmedabad	Prof Shrutie Tamboli Prof Snehal Nagarsheth (*Alternate*)
CSIR-Central Building Research Institute Architecture and Planning Group, Roorkee	Shri S. K. Negi Shri Ashok Kumar (*Alternate*)
Directorate of Education Govt of NCT of Delhi, Delhi	Representative
Forest Research Institute, Dehradun	Dr Sadhna Tripathi Dr Kishan Kumar (*Alternate*)
Godrej & Boyce Mfg Co Ltd, Mumbai	Shri Ega Venkateshwarlu Shri Nirav Shah (*Alternate* I) Shri Lalitesh Mandrekar (*Alternate* II)
Government e-Marketplace, New Delhi	Representative
Indian Furniture Products Ltd (Zuari), Tiruvallur	Shri C. M. Satheesh Kumar Shri S. Saravanan (*Alternate*)
Institute of Indian Interior Designers, Mumbai	Shrimati Chirashree Thakkar
Kendriya Bhandar, New Delhi	Representative
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	Shrimati Rivoo Mahendru Shri S. K. Mishra (*Alternate*)
Ministry of Women and Child Development, New Delhi	Representative
National Institute of Design, Ahmedabad	Shri P. Rama Krishna Rao Shri C. S. Susanth (*Alternate*)
National Institute of Occupational Health (NIOH), Ahmedabad	Shri J. Majumdar
Nilkamal Limited, Mumbai	Shri V. S. Iyer Shri Arvind Janardanam (*Alternate*)
Office of Development Commissioner, Micro Small and Medium Enterprises, New Delhi	Shri K. L. Rao Shri K. K. Funda (*Alternate*)
School of Planning & Architecture, New Delhi	Prof Manoj Mathur Prof Aruna Ramani Grover (*Alternate*)
The Indian Institute of Architects, Mumbai	Ar Vikramray Pramodray Pandya

Organization	*Representative(s)*
The Supreme Industries Limited, New Delhi	Shri Sanjeev Jain Shri Mukesh Kaul (*Alternate* I) Shri Sanjay Dogra (*Alternate* II)
In Personal Capacity (*Pratap Nursery Lane, Near Gurudwara Sahib, Panditwari, Dehradun*)	Shri K. S. Pruthi
BIS Directorate General	Shri Sanjay Pant, Scientist 'F' and Head (Civil Engineering) [Representing Director General (*Ex-officio*)]

Member Secretary

Shri Pradeep Singh Shekhawat
Scientist 'D' (Civil Engineering), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Head (Publication & Sales), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: CED 35 (16970).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower-1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	2821 8093

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.

Published by BIS, New Delhi